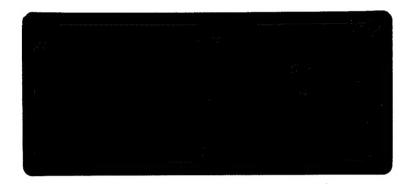
## REPORT DOCUMENTATION PAGE

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THIS INVESTIGATION WAS THE RESULT OF THE CONTINUED INTEREST IN INFILTRATION POTENTIAL IN CERTAIN PORTIONS OF THE RMA. PREVIOUS ESTIMATES OF INFILTRATION WERE BASED ON DATA PRESENTED IN SOIL SURVEY OF ADAMS COUNTY, CO (USDA SOIL CONSERVATION SERVICE AND COLORADO AG EXPERIMENT STATION, 1974). IN ORDER TO OBTAIN MORE SITE-SPECIFIC DATA, TEN SITES WERE SELECTED BY RMA PERSONNEL WHERE DOUBLE-RING INFILTROMETERS WOULD BE INSTALLED AND THEN LEFT IN PLACE. THESE SITES ARE IN THE SOUTH PLANTS AREA AND IN BASIN A.								
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# RESULTS OF DOUBLE RING INFILTROMETER INVESTIGATIONS ROCKY MOUNTAIN ARSENAL JULY 13-15, 1983



#### Introduction

This investigation was the result of the continued interest in infiltration potential in certain portions of the Rocky Mountain Arsenal. Previous estimates of infiltration were based on data presented in Soil Survey of Adams County, Colorado (USDA Soil Conservation Service & Colo. Ag. Exper. Station, 1974). In order to obtain more site-specific data, ten sites were selected by Rocky Mountain Arsenal personnel where double-ring infiltrometers would be installed and then left in place. These sites are in the South Plants Area and in Basin A. Fig. 1 shows the location of all ten sites.

Infiltration is defined as the movement of water into the soil matrix from the surface of the soil. It is normally expressed as a rate (f), e.g., centimeters per hour, etc. Various factors will influence the rate, such as the soil type, vegetal cover, rate of rainfall (or the rate at which water is available to enter the soil), chemical properties of the soil and the water, etc. It is also important to note that infiltration will vary with time. On a dry soil the initial infiltration rate may be several times the final or equilibrium rate.

The basic equation governing infiltration is that developed by Horton (1935) which resulted from his work during the early 1930's. This relationship is:

$$f = f_c + (f_o - f_c) e^{-kt}$$

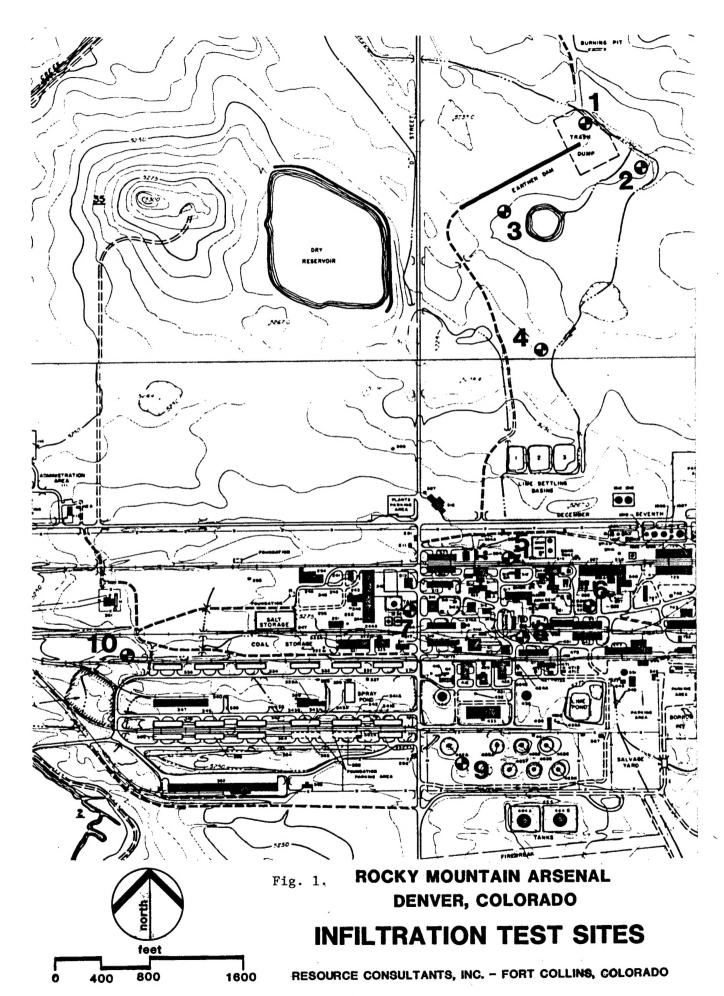
where

f = infiltration rate (depth/time) at time t

k = a constant for the decrease in f

 $f_c = final or equilibrium value of f$ 

 $f_{o}$  = initial infiltration rate



A dual ring infiltrometer was used for these investigations at the Rocky Mountain Arsenal. The procedures for this method are set forth in ASTM Procedure Number D 3385-75 (American Society for Testing and Materials, 1978). The procedure is also discussed by Johnson (1963) in U. S. Geological Survey Water-Supply Paper No. 1544-F.

The dual rings of the infiltrometer were constructed of 10-gauge metal. The inner ring has an inside diameter of 12 inches and the outside ring has an inside diameter of 18 inches. Both rings are 12 inches deep. The inside ring was driven into the soil matrix a depth of 2 inches and the outside ring was driven to a depth of 5 inches. Inside the inner ring and between the two rings a small diameter metal rod, sharpened at the tip, was used as a reference point so the water would be kept at the desired level of 3 inches. Figures 2 through 5 show a typical installation.

#### Results Obtained

Fig. 1 shows the locations of the two sites selected. A detailed description of each site is included in Appendix A. Figures 6 through 15 show the graphical determination of the infiltration rates over time. It is important to note that the tests conducted were under a "dry soil" condition. Complete numerical data for these ten sites are shown in Appendix B and the  $f_{\rm c}$  values are shown in Table 1.

Site	f <sub>c</sub> <u>1</u> /
	(cm/hr)
1	0.03
2	0.04
3	0.03
4	Data not meaningful
5	0.23
6	2.55
7	0.74
8	1.03
9	1.93
10	5.21

Values were determined graphically from Figures 6 through 16.

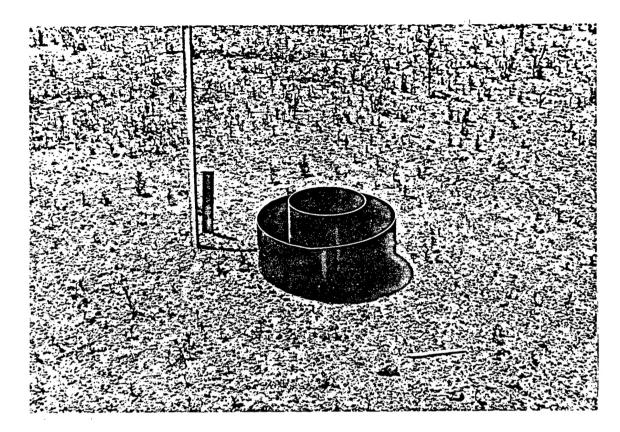


Fig. 2. Typical View of Double Ring Infiltrometer

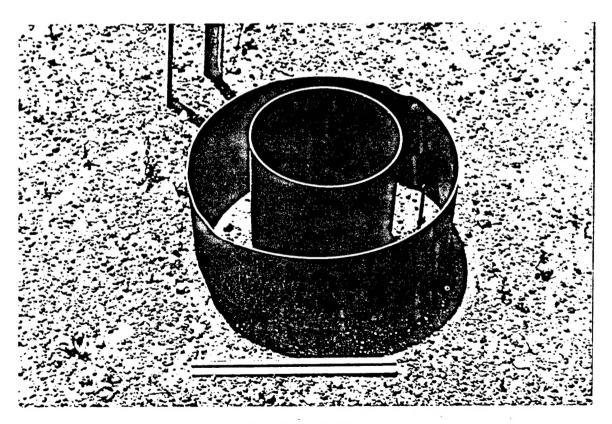


Fig. 3. Typical View of Double Ring Infiltrometer

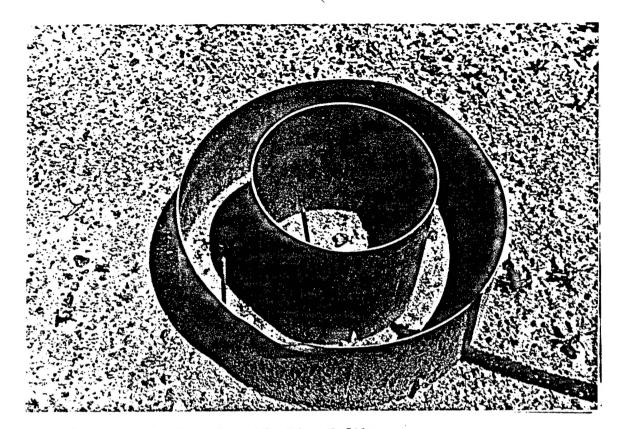


Fig. 4. Typical View of Double Ring Infiltrometer

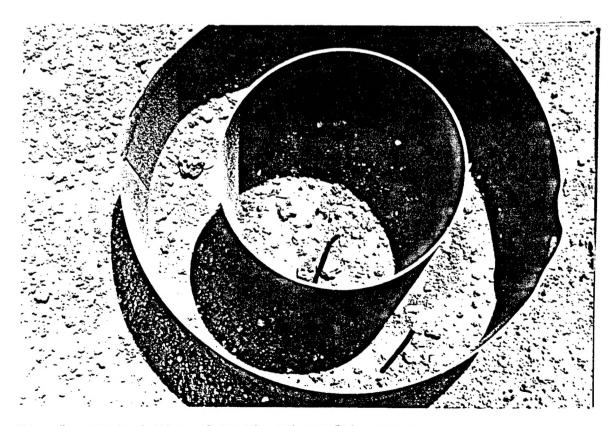
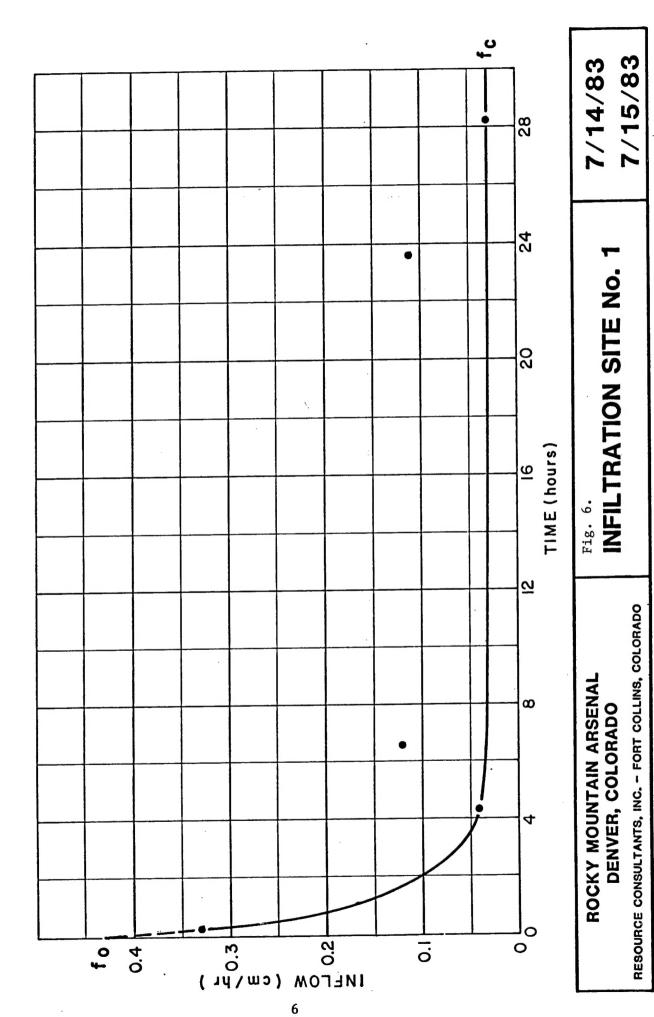
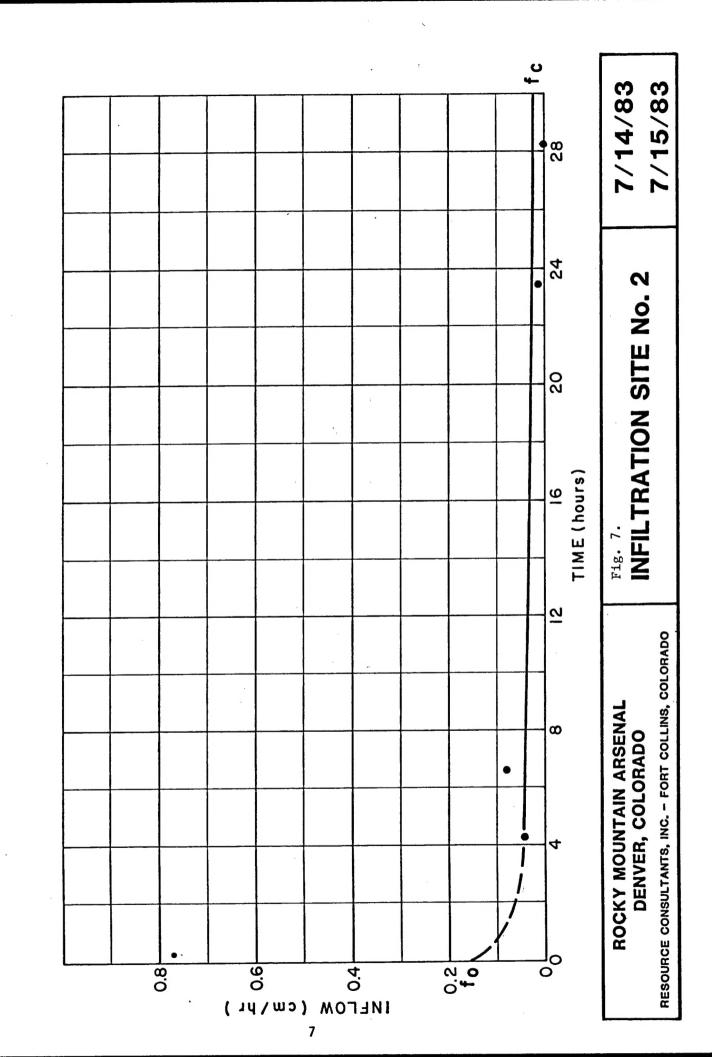
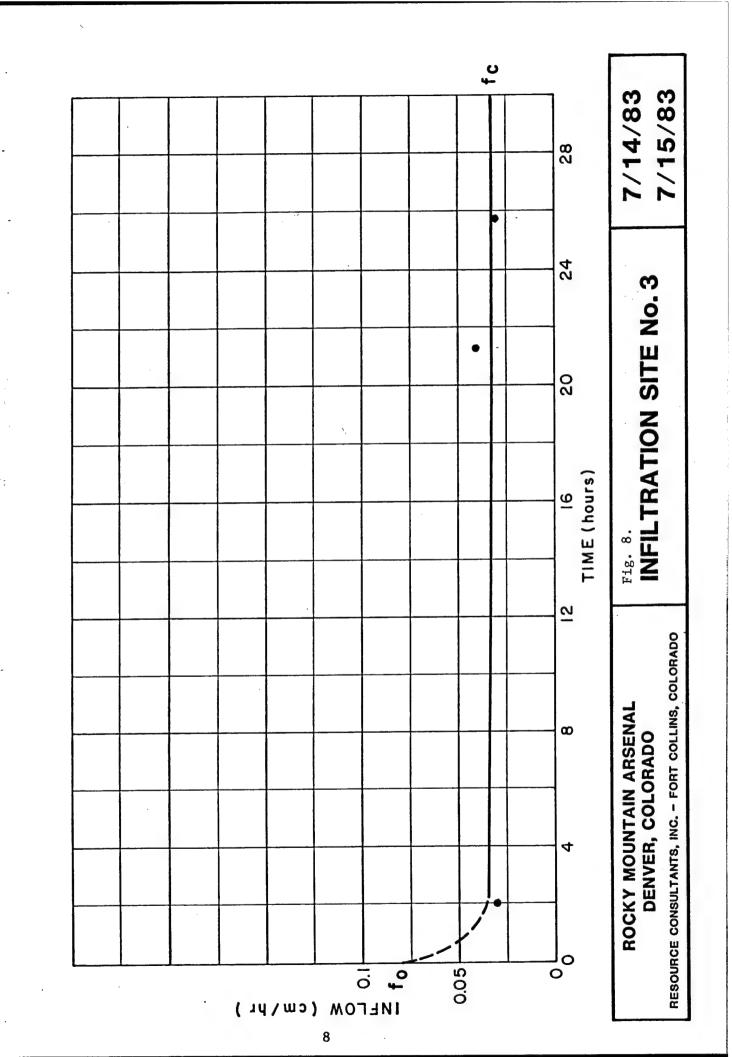
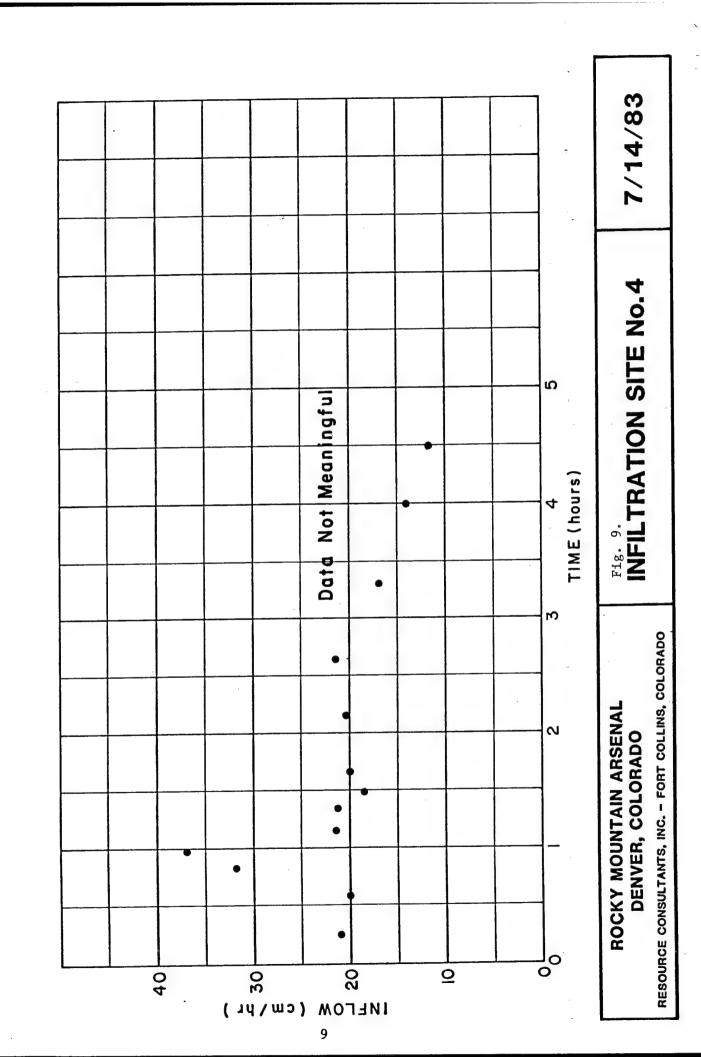


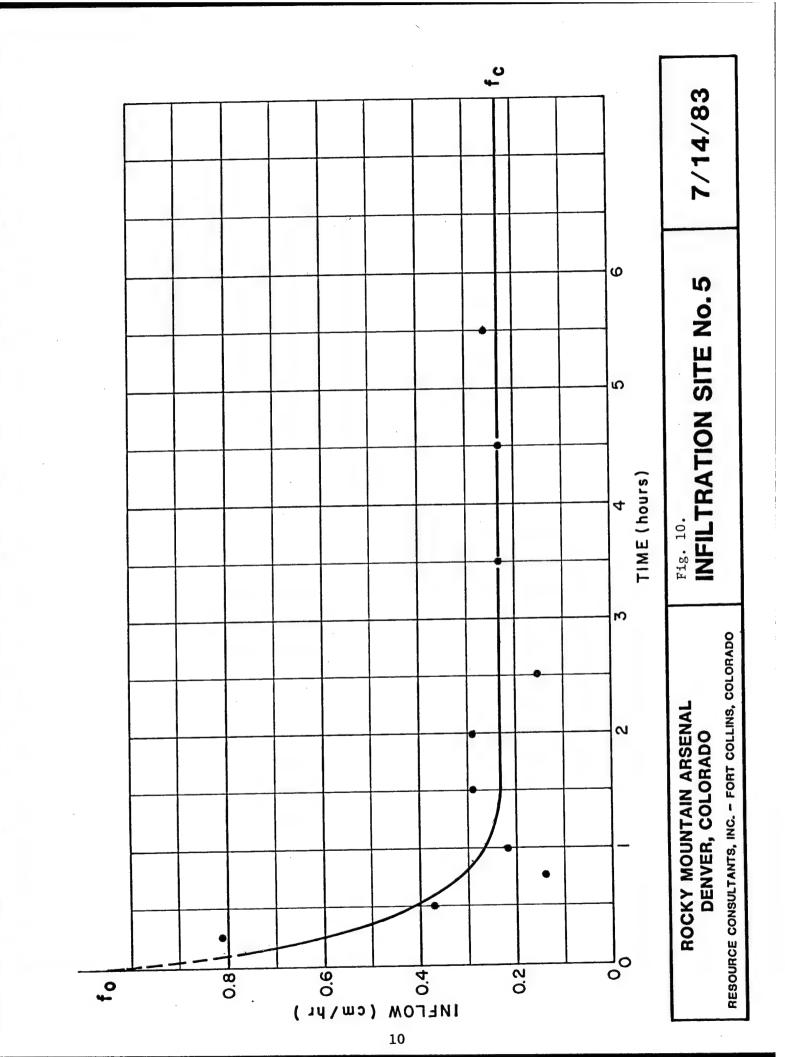
Fig. 5. Typical View of Double Ring Infiltrometer

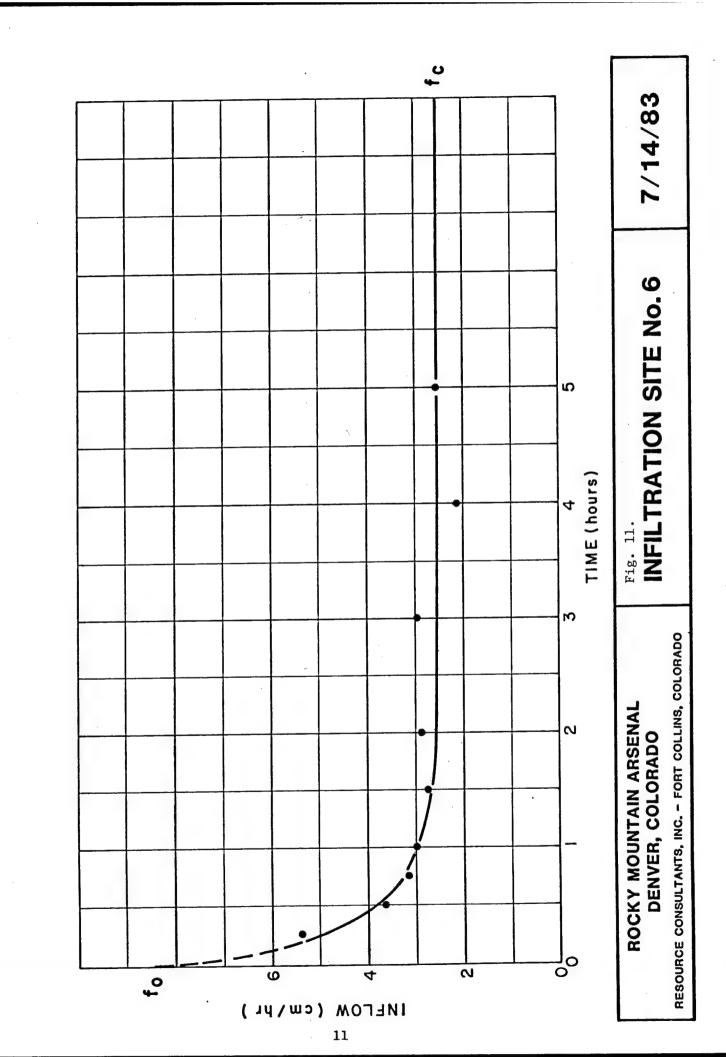


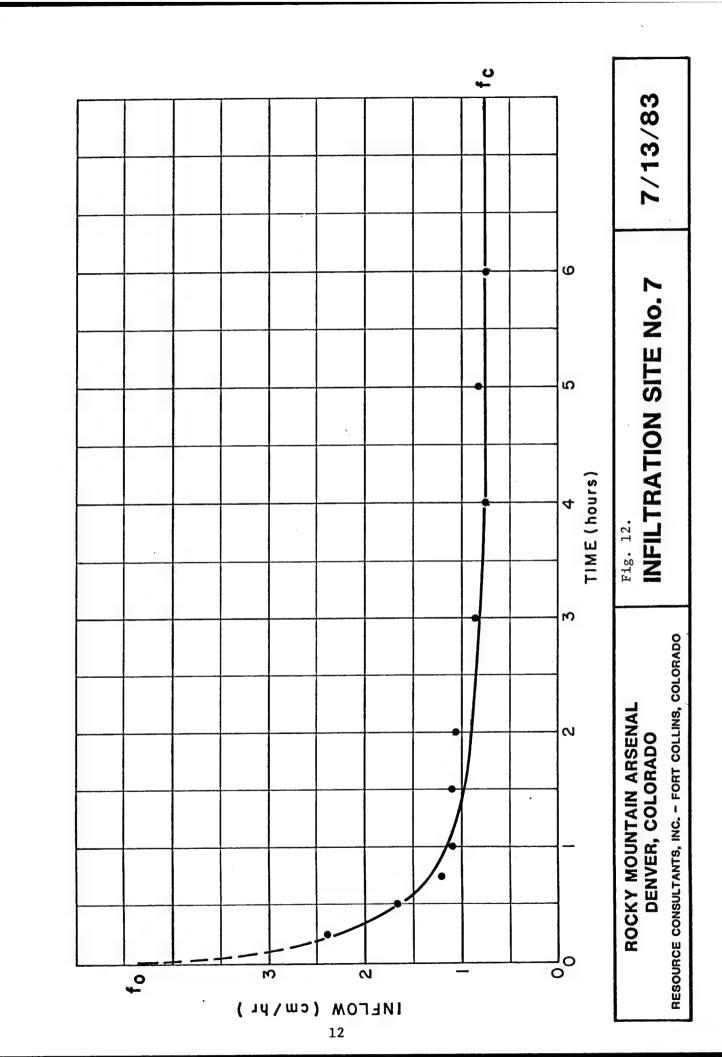


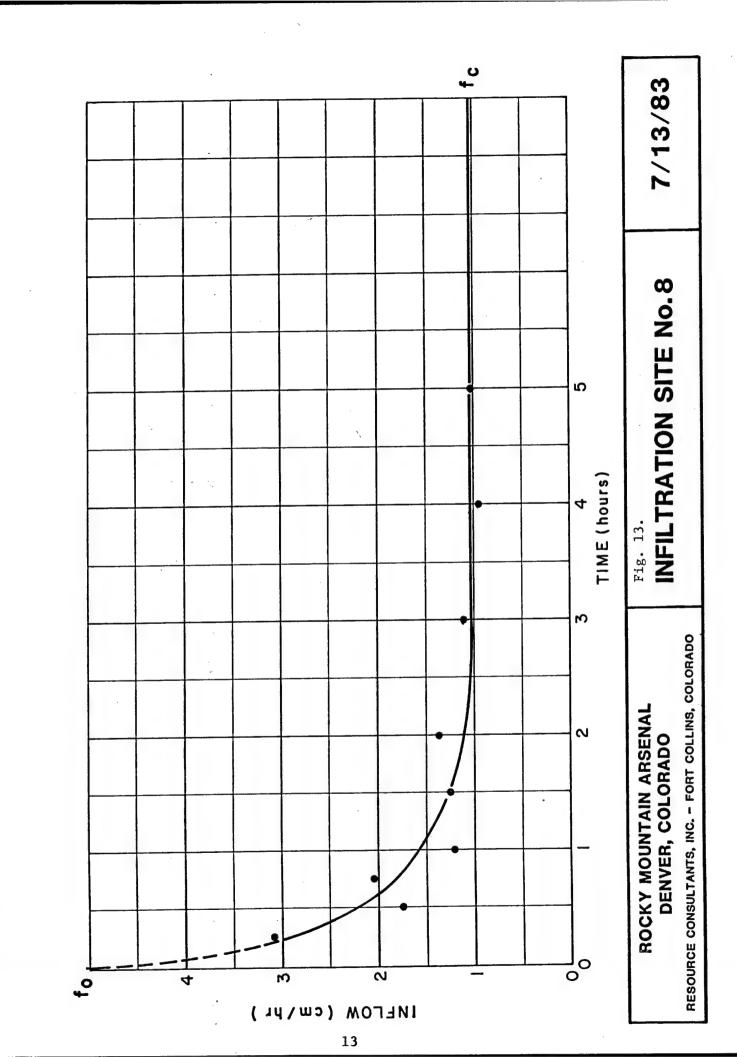


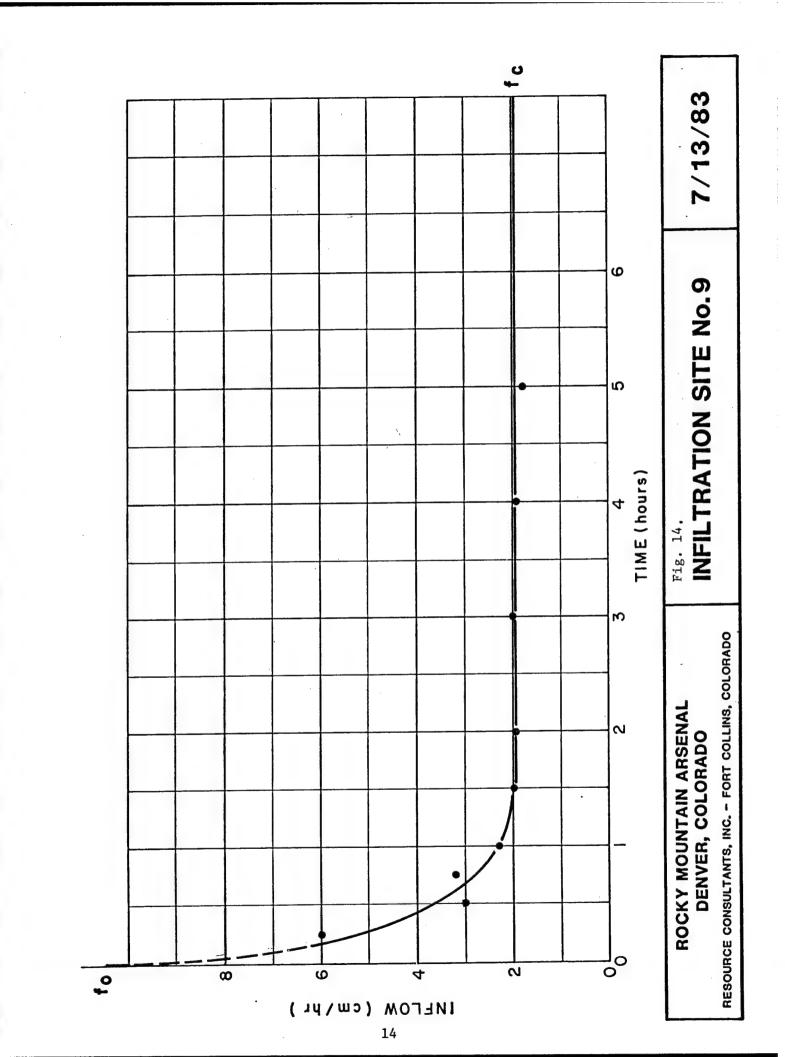


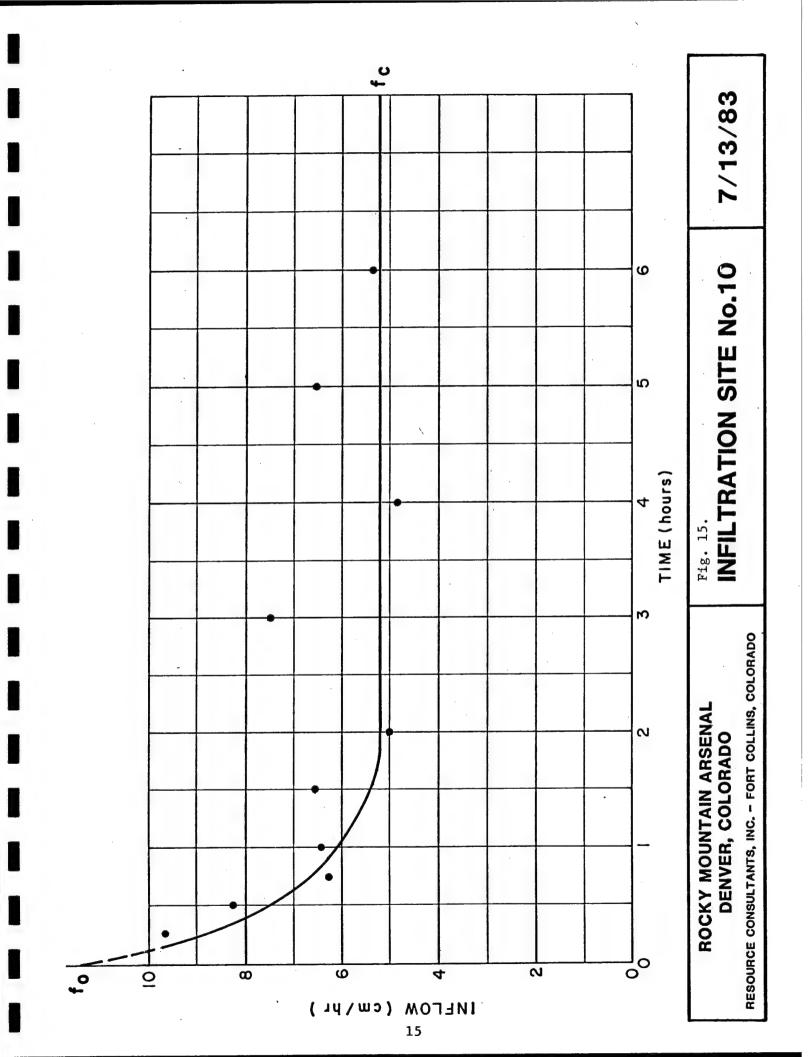












#### Recommendations and Conclusions

Data in this report are based on one series of tests only. If this information is to be used for design purposes, the series should be repeated. Site #4 appears to be a difficult site for infiltration tests. It is reommended that this site be moved to a more favorable location.

Data in Table 1 indicate some very low values of infiltration rates. Any value less than about 0.1 centimeters per hour should be considered as impermeable for surface-water runoff computations.

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APPENDIX B

Numerical Data for Test Sites

ROCKY MOUNTAIN ARSENAL INFILTRATION TESTS JULY 1983

1 7/14/83 650 729.66 0 0 0 0 0 1 105 729.66 15 .25 .25 60 .33 1105 729.66 140 2.33 6.58 200 .12 7/15/83 615 729.66 1010 16.83 23.42 1320 .11 1100 729.66 285 4.75 28.17 110 .03 1110 729.66 285 4.75 28.17 110 .03 11112 729.66 240 4.00 4.25 120 .04 1332 729.66 1010 16.83 23.42 1320 .11 11112 729.66 240 4.00 4.25 120 .04 1332 729.66 1010 16.83 13.5 130 .08 7/12 729.66 140 2.33 6.58 130 .08 7/12 729.66 140 2.33 6.58 130 .08 7/15/83 630 729.66 1018 16.97 23.55 80 .01 1105 729.66 275 4.58 28.13 1 .00 1110 729.66 270 4.50 25.80 110 .03 1100 729.66 120 2.00 2.00 40 .03 7/15/83 640 729.66 120 2.00 2.00 40 .03 7/15/83 640 729.66 120 2.00 2.00 40 .03 7/15/83 640 729.66 120 2.00 2.00 40 .03 1110 .03 1110 729.66 15 .25 .25 .82 500 .04 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1110 .03 1	SITE #	DATE	TIME	AREA (CH++2)		ERVAL (HOURS)	TOTAL HOURS	VOL (ML)	INFLOW (CM/HR)
705 729.66 15 .25 .25 60 .33 1105 729.66 240 4.00 4.25 110 .04 1105 729.66 140 2.33 6.58 200 .12 7/15/83 615 729.66 1010 16.83 23.42 1320 .11 1100 729.66 285 4.75 28.17 110 .03  2 7/14/83 657 729.66 15 .25 .25 140 .77 1112 729.66 240 4.00 4.25 120 .04 1332 729.66 140 2.33 6.58 130 .08 7/15/83 630 729.66 1018 16.97 23.55 80 .01 1105 729.66 275 4.58 28.13 1 .00  3 7/14/15 922 729.66 120 2.00 2.00 40 .03 7/15/83 640 729.66 1158 19.30 21.30 560 .04 1110 729.66 270 4.50 25.80 110 .03  4 7/14/83 916 729.66 15 .25 .25 .82 5900 32.34 1015 729.66 17 .32 .57 4670 20.21 1005 729.66 15 .25 .25 .82 5900 32.34 1015 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 1.15 2610 21.46 1033 729.66 10 .17 1.55 240 20.06 1025 729.66 10 .17 1.52 2590 21.30 1045 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.52 2590 21.30 1045 729.66 10 .17 1.52 2440 20.06 1125 729.66 30 .50 2.15 7410 20.31 1125 729.66 30 .50 2.55 7750 21.24 1233 729.66 40 .67 3.98 6730 13.84 1345 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .50 05 .50 .150 105 .29 1037 729.66 30 .50 .50 .50 1.50 105 .29 1037 729.66 30 .50 .50 1.50 105 .29 1037 729.66 30 .50 .50 1.50 105 .29 1037 729.66 30 .50 .50 1.50 105 .29 1037 729.66 30 .50 .50 1.50 105 .29 1037 729.66 30 .50 .50 1.50 105 .29	1	7/14/83	650	729.66	0	0	0		
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7/15/83 615 729.66 140 2.33 6.58 200 .12 7/15/83 615 729.66 1010 16.83 23.42 1320 .11 1100 729.66 285 4.75 28.17 110 .03  2 7/14/83 657 729.66 0 0 0 0 0 0 712 729.66 15 .25 .25 140 .77 1112 729.66 15 .25 .25 140 .77 1112 729.66 140 2.33 6.58 130 .08 7/15/83 630 729.66 1018 16.97 23.55 80 .01 1105 729.66 275 4.58 28.13 1 .00  3 7/14/15 922 729.66 120 2.00 2.00 40 .03 7/15/83 640 729.66 120 2.00 2.00 40 .03 7/15/83 640 729.66 155 19.30 21.30 560 .04 1110 729.66 270 4.50 25.80 110 .03  4 7/14/83 916 729.66 15 .25 .25 .82 5900 32.34 1015 729.66 15 .25 .25 .82 5900 32.34 1015 729.66 15 .25 .25 .25 .3810 20.89 950 729.66 15 .25 .25 .25 .3810 20.89 950 729.66 15 .25 .25 .25 .3810 20.89 1025 729.66 10 .17 .88 4500 37,00 1025 729.66 10 .17 1.35 2590 21.30 1045 729.66 10 .17 1.35 2590 21.30 1045 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.65 2440 20.06 1125 729.66 30 .50 2.65 7750 21.24 1235 729.66 30 .50 2.65 7750 21.24 1235 729.66 30 .50 2.65 7750 21.24 1235 729.66 30 .50 2.65 7750 21.24 1235 729.66 30 .50 2.65 7750 21.24 1235 729.66 15 .25 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 68 .37 927 729.66 15 .25 .50 .50 68 .37 927 729.66 15 .25 .50 .50 68 .37 927 729.66 15 .25 .50 .50 68 .37 927 729.66 15 .25 .50 .50 68 .37 927 729.66 15 .25 .50 .50 68 .37 927 729.66 15 .25 .50 .50 68 .37 927 729.66 15 .25 .50 .50 68 .37 927 729.66 15 .25 .50 .50 68 .37 927 729.66 15 .25 .50 .50 68 .37			1105	729.66	240				
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7/14/83 657 729.66 0 0 0 0 0 0 7/12 729.66 15 .25 .25 .25 140 .77 1110 729.66 15 .25 .25 .25 140 .77 1110 729.66 140 2.33 6.58 130 .08 7/15/83 630 729.66 1018 16.97 23.55 80 .01 1105 729.66 275 4.58 28.13 1 .00 1122 729.66 120 2.00 2.00 40 .03 7/15/83 640 729.66 120 2.00 2.00 40 .03 7/15/83 640 729.66 1158 19.30 21.30 560 .04 1110 729.66 270 4.50 25.80 110 .03 1110 729.66 15 .25 .25 3810 20.89 950 729.66 15 .25 .25 3810 20.89 950 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 1.15 2610 21.46 1035 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 20.01 1125 729.66 10 .17 1.48 2260 20.01 1125 729.66 10 .17 1.48 2260 20.01 1125 729.66 10 .17 1.48 2260 20.01 1125 729.66 10 .17 1.48 2260 20.01 1125 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.65 2440 20.06 1125 729.66 10 .17 1.65 2440 20.06 1125 729.66 10 .17 1.65 2440 20.06 1125 729.66 10 .17 1.65 2440 20.06 1125 729.66 10 .17 1.65 2440 20.06 1125 729.66 10 .17 1.65 2440 20.06 1125 729.66 10 .17 1.65 2440 20.06 1125 729.66 10 .17 1.65 2440 20.06 1125 729.66 10 .17 1.65 2440 20.06 1125 729.66 10 .50 2.15 7410 20.31 1155 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.98 6430 13.84 1345 729.66 15 .25 .25 .50 68 .37 922 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .25 .75 .25 .14 937 729.66 15 .25 .25 .75 .25 .14 937 729.66 15 .25 .25 .50 .50 .50 .29 1007 729.66 00 .50 .50 .2.00 105 .29 1007 729.66 00 .50 .50 .2.00 105 .29 1007 729.66 00 .50 .50 .2.00 105 .29 1007 729.66 00 .50 .50 .50 .2.00 105 .29 1107 729.66 00 .50 .50 .50 .50 .50 .50 .50 .20 .20 105 .2		7/15/83	615	729.66	1010	16.83			
712 729.66 15 .25 .25 140 .77 1112 729.66 240 4.00 4.25 120 .04 1332 729.66 140 2.33 6.58 130 .08 7/15/83 630 729.66 1018 16.97 23.55 80 .01 1105 729.66 275 4.58 28.13 1 .00  3 7/14/15 922 729.66 120 2.00 2.00 40 .03 7/15/83 640 729.66 1158 19.30 21.30 560 .04 1110 729.66 15 .25 .25 80 110 .03  4 7/14/83 916 729.66 15 .25 .25 3810 20.89 950 729.66 17 .32 .57 4670 20.21 1005 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 1.32 2590 21.30 1045 729.66 10 .17 1.32 2590 21.30 1045 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 30 .50 2.15 7410 20.31 1125 729.66 30 .50 2.15 7410 20.31 1125 729.66 40 .67 3.98 6730 13.84 1345 729.66 40 .67 3.98 6730 13.84 1345 729.66 15 .25 .55 .50 68 .37 922 729.66 15 .25 .55 .50 68 .37 927 729.66 15 .25 .55 .50 68 .37 927 729.66 15 .25 .55 .50 68 .37 927 729.66 15 .25 .55 .50 68 .37 927 729.66 15 .25 .50 .50 2.00 105 .29 1007 729.66 30 .50 .50 2.00 105 .29 1007 729.66 30 .50 .50 2.00 105 .29 1007 729.66 30 .50 .50 2.00 105 .29 1107 729.66 30 .50 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23			1100	729.66	285	4.75	28.17	110	
712 729.66 15 .25 .25 120 .04 .1112 729.66 240 4.00 4.25 120 .04 .1332 729.66 140 2.33 6.58 130 .08 .7715/83 630 729.66 1018 16.97 23.55 80 .01 .1105 729.66 275 4.58 28.13 1 .00 .00 .00 .00 .00 .00 .00 .00 .00 .	2	7/14/83	657	729.66	0	0	0	0	
1112 729.66 240 4.00 4.25 120 .04 1332 729.66 140 2.33 6.58 130 .08 7/15/83 630 729.66 1018 16.97 23.55 80 .01 1105 729.66 275 4.58 28.13 1 .00  3 7/14/15 922 729.66 120 2.00 2.00 40 .03 7/15/83 640 729.66 1158 19.30 21.30 550 .04 1110 729.66 270 4.50 25.80 110 .03  4 7/14/83 916 729.66 15 .25 .25 3810 20.89 950 729.66 19 .32 .57 4670 20.21 1005 729.66 15 .25 .25 182 5900 32.34 1015 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 1.35 2610 21.46 1035 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1155 729.66 30 .50 2.15 7410 20.31 1155 729.66 30 .50 2.57 750 21.24 1235 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.32 8180 16.82 1315 729.66 30 .50 2.65 7750 21.24 1235 729.66 30 .50 2.65 7750 21.24 1235 729.66 15 .25 .50 68 .37 972 729.66 15 .25 .50 68 .37 972 729.66 15 .25 .75 25 .14 937 729.66 15 .25 .75 25 .14 937 729.66 15 .25 .50 68 .37 972 729.66 15 .25 .50 68 .37 972 729.66 15 .25 .50 68 .37 972 729.66 15 .25 .50 68 .37 972 729.66 15 .25 .75 25 .14 937 729.66 15 .25 .75 25 .14 937 729.66 15 .25 .50 68 .37 972 729.66 15 .25 .50 68 .37 972 729.66 15 .25 .50 68 .37 972 729.66 15 .25 .50 68 .37 972 729.66 15 .25 .50 68 .37 972 729.66 15 .25 .50 68 .37 972 729.66 15 .25 .75 25 .14									
7/15/83 &30 729.66 140 2.33 6.58 130 .08 7/15/83 &30 729.66 1018 16.97 23.55 80 .01 1105 729.66 275 4.58 28.13 1 .00  3 7/14/15 922 729.66 0 0 0 0 0 1122 729.66 120 2.00 2.00 40 .03 7/15/83 640 729.66 1158 19.30 21.30 560 .04 1110 729.66 270 4.50 25.80 110 .03  4 7/14/83 916 729.66 0 0 0 0 0 931 729.66 15 .25 .25 3810 20.89 950 729.66 19 .32 .57 4670 20.21 1005 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 1.32 2590 21.30 1045 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 30 .50 2.15 7410 20.31 1155 729.66 30 .50 2.65 7750 21.24 1235 729.66 30 .50 2.65 7750 21.24 1235 729.66 30 .50 2.65 7750 21.24 1235 729.66 30 .50 2.65 7750 21.24 1345 729.66 30 .50 4.48 4260 11.68									
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3       7/14/15       922       729.66       0       0       0       0       0       0       103         7/15/83       640       729.66       120       2.00       2.00       40       103         7/15/83       640       729.66       1158       19.30       21.30       560       .04         1110       729.66       270       4.50       25.80       110       .03         4       7/14/83       916       729.66       15       .25       .25       3810       20.89         950       729.66       19       .32       .57       4670       20.21       1005       729.66       19       .32       .57       4670       20.21       1005       729.66       10       .17       .98       4500       37.00         1025       729.66       10       .17       .98       4500       37.00       20.21       1005       729.66       10       .17       .18       2250       21.30         1035       729.66       10       .17       1.48       2250       18.58       1055       729.66       10       .17       1.48       2250       18.58       1055       125       7250		7/15/83							
7/15/83 640 729.66 120 2.00 2.00 40 .03 7/15/83 640 729.66 1158 19.30 21.30 560 .04 1110 729.66 270 4.50 25.80 110 .03  4 7/14/83 916 729.66 0 0 0 0 0 931 729.66 15 .25 .25 3810 20.89 950 729.66 19 .32 .57 4670 20.21 1005 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 1.15 2610 21.46 1035 729.66 10 .17 1.32 2590 21.30 1045 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 30 .50 2.15 7410 20.31 1155 729.66 30 .50 2.15 7410 20.31 1155 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.32 8180 16.82 1335 729.66 30 .50 4.48 4260 11.68  5 7/14/83 837 729.66 15 .25 .25 .25 147 .81 907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .50 .50 .20 1007 729.66 30 .50 .50 2.50 55 .15 1207 729.66 30 .50 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23									
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7/15/83 640 729.66 1158 19.30 21.30 560 .04 1110 729.66 270 4.50 25.80 110 .03  4 7/14/83 916 729.66 0 0 0 0 0 0 931 729.66 15 .25 .25 3810 20.89 950 729.66 19 .32 .57 4670 20.21 1005 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 1.15 2610 21.46 1035 729.66 10 .17 1.32 2590 21.30 1045 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.48 2260 18.58 1055 729.66 30 .50 2.15 7410 20.31 1155 729.66 30 .50 2.15 7410 20.31 1155 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.32 8180 16.82 1315 729.66 30 .50 4.48 4260 11.68  5 7/14/83 837 729.66 30 .50 4.48 4260 11.68  5 7/14/83 837 729.66 15 .25 .25 .50 68 .37 922 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 15 .25 .75 .25 .14 937 729.66 30 .50 .50 2.50 55 .15 1207 729.66 30 .50 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23									-
4       7/14/83       916       729.66       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0        0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0		7/15/83							
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950 729.66 19 .32 .57 4670 20.21 1005 729.66 15 .25 .82 5900 32.34 1015 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 1.15 2610 21.46 1035 729.66 10 .17 1.32 2590 21.30 1045 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.65 2440 20.06 1125 729.66 30 .50 2.65 7750 21.24 1235 729.66 30 .50 2.65 7750 21.24 1235 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.98 6730 13.84 1345 729.66 30 .50 4.48 4260 11.68  5 7/14/83 837 729.66 15 .25 .25 147 .81 907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 25 .14 937 729.66 30 .50 .50 1.50 105 .29 1037 729.66 30 .50 2.00 105 .29 1037 729.66 30 .50 2.50 55 .15 1207 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23			931	729.66	15	.25			
1005 729.66 15 .25 .82 5900 32.34 1015 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 1.15 2610 21.46 1035 729.66 10 .17 1.32 2590 21.30 1045 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.65 2440 20.06 1125 729.66 30 .50 2.15 7410 20.31 1155 729.66 30 .50 2.65 7750 21.24 1235 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.98 6730 13.84 1345 729.66 30 .50 4.48 4260 11.68  5 7/14/83 837 729.66 15 .25 .25 147 .81 907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 25 .14 937 729.66 30 .50 1.50 105 .29 1037 729.66 30 .50 2.50 55 .15 1207 729.66 30 .50 2.50 55 .15 1207 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23			950		19				
1015 729.66 10 .17 .98 4500 37.00 1025 729.66 10 .17 1.15 2610 21.46 1035 729.66 10 .17 1.32 2590 21.30 1045 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.65 2440 20.06 1125 729.66 30 .50 2.15 7410 20.31 1155 729.66 30 .50 2.65 7750 21.24 1235 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.98 6730 13.84 1345 729.66 30 .50 4.48 4260 11.68 1345 729.66 15 .25 .25 147 .81 907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 25 .14 937 729.66 15 .25 .75 25 .14 937 729.66 30 .50 1.50 105 .29 1037 729.66 30 .50 2.50 55 .15 1207 729.66 30 .50 2.50 55 .15 1207 729.66 30 .50 2.50 55 .15 1207 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23 1307 729.66 60 1.00 4.50 170 .23			1005	729.66	15				
1025 729.66 10 .17 1.15 2610 21.46 1035 729.66 10 .17 1.32 2590 21.30 1045 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.65 2440 20.06 1125 729.66 30 .50 2.15 7410 20.31 1155 729.66 30 .50 2.65 7750 21.24 1235 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.98 6730 13.84 1345 729.66 30 .50 4.48 4260 11.68  5 7/14/83 837 729.66 15 .25 .25 147 .81 907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 25 .14 937 729.66 30 .50 1.50 105 .29 1037 729.66 30 .50 2.00 105 .29 1107 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23			1015	729.66	10				
1035 729.66 10 .17 1.32 2590 21.30 1045 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.65 2440 20.06 1125 729.66 30 .50 2.15 7410 20.31 1155 729.66 30 .50 2.65 7750 21.24 1235 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.98 6730 13.84 1345 729.66 30 .50 4.48 4260 11.68  5 7/14/83 837 729.66 15 .25 .25 147 .81 907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 25 .14 937 729.66 15 .25 .75 25 .14 937 729.66 30 .50 1.50 105 .29 1037 729.66 30 .50 2.50 55 .15 1207 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23			1025	729.66	10				
1045 729.66 10 .17 1.48 2260 18.58 1055 729.66 10 .17 1.65 2440 20.06 1125 729.66 30 .50 2.15 7410 20.31 1155 729.66 30 .50 2.65 7750 21.24 1235 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.98 6730 13.84 1345 729.66 30 .50 4.48 4260 11.68  5 7/14/83 837 729.66 15 .25 .25 147 .81 907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 25 .14 937 729.66 15 .25 .75 25 .14 937 729.66 15 .25 .75 25 .14 937 729.66 30 .50 1.50 105 .29 1037 729.66 30 .50 2.00 105 .29 1107 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23			1035	729.66	10				
1055 729.66 10 .17 1.65 2440 20.06 1125 729.66 30 .50 2.15 7410 20.31 1155 729.66 30 .50 2.65 7750 21.24 1235 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.98 6730 13.84 1345 729.66 30 .50 4.48 4260 11.68  5 7/14/83 837 729.66 15 .25 .25 147 .81 907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 25 .14 937 729.66 15 .25 .75 25 .14 937 729.66 15 .25 .75 25 .14 937 729.66 30 .50 1.50 105 .29 1037 729.66 30 .50 2.00 105 .29 1107 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23			1045		10				
1125 729.66 30 .50 2.15 7410 20.31 1155 729.66 30 .50 2.65 7750 21.24 1235 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.98 6730 13.84 1345 729.66 30 .50 4.48 4260 11.68  5 7/14/83 837 729.66 15 .25 .25 147 .81 907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 25 .14 937 729.66 15 .25 .75 25 .14 937 729.66 30 .50 1.50 105 .29 1037 729.66 30 .50 2.00 105 .29 1107 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23			1055	729.66	10				
1155 729.66 30 .50 2.65 7750 21.24 1235 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.98 6730 13.84 1345 729.66 30 .50 4.48 4260 11.68  5 7/14/83 837 729.66 15 .25 .25 147 .81 907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 25 .14 937 729.66 15 .25 .75 25 .14 937 729.66 15 .25 1.00 40 .22 1007 729.66 30 .50 1.50 105 .29 1037 729.66 30 .50 2.00 105 .29 1107 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23			1125	729.66	30	.50			
1235 729.66 40 .67 3.32 8180 16.82 1315 729.66 40 .67 3.98 6730 13.84 1345 729.66 30 .50 4.48 4260 11.68  5 7/14/83 837 729.66 15 .25 .25 147 .81 907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 25 .14 937 729.66 15 .25 .75 25 .14 937 729.66 15 .25 1.00 40 .22 1007 729.66 30 .50 1.50 105 .29 1037 729.66 30 .50 2.00 105 .29 1107 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23				729.66	30	.50		7750	
1315 729.66 40 .67 3.98 6730 13.84 1345 729.66 30 .50 4.48 4260 11.68  5 7/14/83 837 729.66 0 0 0 0 0 852 729.66 15 .25 .25 147 .81 907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 25 .14 937 729.66 15 .25 1.00 40 .22 1007 729.66 30 .50 1.50 105 .29 1037 729.66 30 .50 2.00 105 .29 1107 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23				729.66	40	.67	3.32		
5     7/14/83     837     729.66     0     0     0     0     0     0       852     729.66     15     .25     .25     147     .81       907     729.66     15     .25     .50     68     .37       922     729.66     15     .25     .75     25     .14       937     729.66     15     .25     1.00     40     .22       1007     729.66     30     .50     1.50     105     .29       1037     729.66     30     .50     2.50     55     .15       1207     729.66     60     1.00     3.50     170     .23       1307     729.66     60     1.00     4.50     170     .23			1315	729.66	40	.67	3.98	6730	
852     729.66     15     .25     .25     147     .81       907     729.66     15     .25     .50     68     .37       922     729.66     15     .25     .75     25     .14       937     729.66     15     .25     1.00     40     .22       1007     729.66     30     .50     1.50     105     .29       1037     729.66     30     .50     2.50     55     .15       1207     729.66     60     1.00     3.50     170     .23       1307     729.66     60     1.00     4.50     170     .23			1345	729.66	30	.50	4.48	4260	11.68
907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 25 .14 937 729.66 15 .25 1.00 40 .22 1007 729.66 30 .50 1.50 105 .29 1037 729.66 30 .50 2.00 105 .29 1107 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23 1307 729.66 60 1.00 4.50 170 .23	5	7/14/83	837	729.66	0	0	0	0	0
907 729.66 15 .25 .50 68 .37 922 729.66 15 .25 .75 25 .14 937 729.66 15 .25 1.00 40 .22 1007 729.66 30 .50 1.50 105 .29 1037 729.66 30 .50 2.00 105 .29 1107 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23 1307 729.66 60 1.00 4.50 170 .23			852	729.66	15	.25	.25	147	.81
922     729.66     15     .25     .75     25     .14       937     729.66     15     .25     1.00     40     .22       1007     729.66     30     .50     1.50     105     .29       1037     729.66     30     .50     2.00     105     .29       1107     729.66     30     .50     2.50     55     .15       1207     729.66     60     1.00     3.50     170     .23       1307     729.66     60     1.00     4.50     170     .23			. 907	729.66	15	. 25	.50		
937     729.66     15     .25     1.00     40     .22       1007     729.66     30     .50     1.50     105     .29       1037     729.66     30     .50     2.00     105     .29       1107     729.66     30     .50     2.50     55     .15       1207     729.66     60     1.00     3.50     170     .23       1307     729.66     60     1.00     4.50     170     .23				729.66	15	.25	.75	25	
1007     729.66     30     .50     1.50     105     .29       1037     729.66     30     .50     2.00     105     .29       1107     729.66     30     .50     2.50     55     .15       1207     729.66     60     1.00     3.50     170     .23       1307     729.66     60     1.00     4.50     170     .23				729.66					
1037 729.66 30 .50 2.00 105 .29 1107 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23 1307 729.66 60 1.00 4.50 170 .23				729.66	30				
1107 729.66 30 .50 2.50 55 .15 1207 729.66 60 1.00 3.50 170 .23 1307 729.66 60 1.00 4.50 170 .23			1037	729.66	30				
1207 729.66 60 1.00 3.50 170 .23 1307 729.66 60 1.00 4.50 170 .23				729.66	30				
1307 729.66 60 1.00 4.50 170 .23				729.66	60	1.00			
Trans.				729.66	60				
			1407	729.66	60				

<sup>1/</sup>Zero indicates "no data."

SITE #	DATE	TIME	AREA	INTE	ERVAL	TOTAL	VOL	INFLOW
			(CM±+2)	(MIN)			(ML)	(CM/HR)
6	7/14/83	900	729.66		0	0	0	0 <u>1</u> /
		915_	729.66		.25	.25	975	5.34
		930	729.66		. 25	.50	865	3.65
		945	729.66		. 25	.75	575	3.15
		1000	729.66		.25	1.00	545	2.99
		1030	729.66	30	.50	1.50	1000	2.74
		1100	729.66		.50	2.00	1055	2.89
		1200	729.66	60 -	1.00	3.00	2170	2.97
		1300	729.66	60	1.00	4.00	1545	2.12
		1400	729.66	60	1.00	5.00	1870	2.56
_								
7	7/13/83	1211	729.66		0	0	0	0
		1226	729.66		.25	. 25	438	2.40
		1241	729.66		.25	.50	304	1.67
		1256	729.66		.25	.75	217	1.20
		1311	729.66		. 25	1.00	201	1.10
		1341			.50	1.50	393	1.08
		1411	729.66		.50	2.00	384	1.05
		1511	729.66			3.00	624	.86
		1611	729.66		1.00	4.00	560	.77
		1711	729.66		1.00	5.00	600	.82
	•	1811	729.66	60	1.00	6.00	540	.74
	24240			_	_			
8	7/13/83	1350	729.66		0	0	0	0
	•	1405	729.66		.25	. 25	560	3.07
		1420	729.66		.25	-50	320	1.75
		1435	729.66		.25	.75	370	2.03
		1450	729.66	15	- 25	1.00	220	1.21
		1520 1550	729.66		.50	1.50	460	1.26
		1650	729.66		.50	2.00	500	1.37
		1750	729.66 729.66			3.00	820	1.12
		1850	729.66	60 60	1.00 1.00	4.00	700	.96
		1000	127.00	OV	1.00	5.00	750	1.03
							*	
9	7/13/83	1324	729.66	0	0	0	٥	0
		1339	729.66	-	.25	.25	1092	5.99
		1354	729.66	15	.25	.50	459	2.52
		1409	729.66	15	.25	.75	589	3.23
		1424	729.66	15	.25	1.00	424	2.32
		1454	729.66	30	.50	1.50	716	1.96
		1524	729.66	30	.50	2.00	713	1.95
		1624	729.66	60	1.00	3.00	1452	1.99
		1724	729.66	60	1.00	4.00	1410	1.93
		1824	729.66	60	1.00	5.00	1310	1.80
				•			2020	
10	7/13/83	1230	729.66	0	0	0	0	0
		1245	729.66	15	.25	.25	. 1760	9.65
		1300	729.66	15	.25	.50	1510	8.28
		1315	729.66	15	.25	.75	1140	6.25
		1330	729.66	15	.25	1.00	1170	6.41
		1400	729.66	30	.50	1.50	2390	6.55
		1430	729.66	30	.50	2.00	1820	4.99
		1530	729.66	90	1.00	3.00	5460	7.48
		1645	729.66	75	1.25	4.25	4420	4.85
		1730	727.66	45	.75	5.00	3560	6.51
		1830	729.66	60	1.00	6.00	3900	5.34

<sup>1/</sup>Zero indicates "no data."